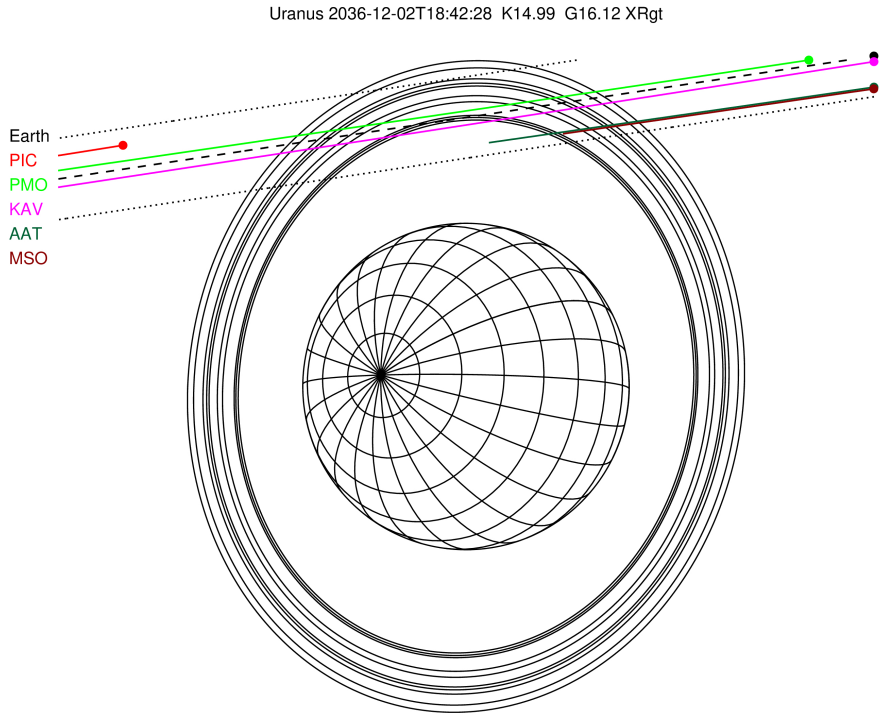
Stellar occultation prediction by rfrench@wellesley.edu Sun Jun 25 01:58:02 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-12-02T18:42:28.650
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Gaia source ID : 869237441534288640
2Mass ID (if available) : 07201437+2235526

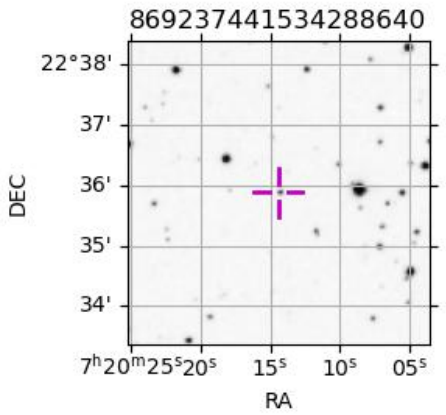
ICRS Star Coord at Epoch: 07h 20m 14.37314s +22:35:52.66966s
RUWE (>1.4 is poor) : 1.04
K magnitude : 14.994
G magnitude : 16.115
RP magnitude : 15.684
BP magnitude : 16.376
DUPflag : 0
Distance (au) : 17.981
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -17.06
Sun-Target sep (deg) : 142.20
Sun-Moon sep (deg) : 48.46
B (ring opening deg) : 58.21
PA of pole (deg) : 82.34

#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



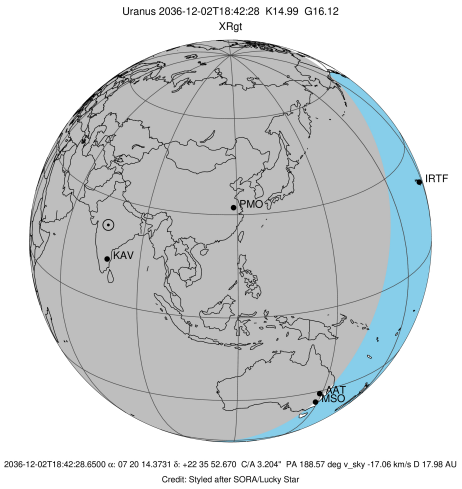
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

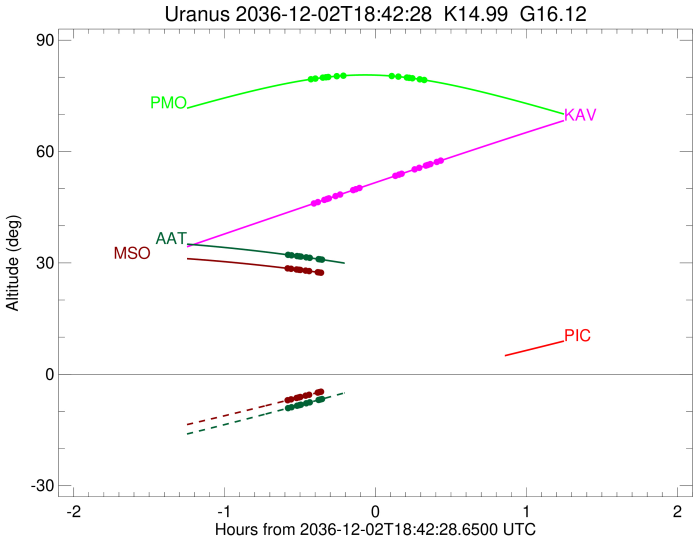
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++++		+++++++	DEC 02 18:17 - DEC 02 19:01	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	++++++++++		++++++++++	DEC 02 18:18 - DEC 02 19:07	PnnRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1	++++++++++			DEC 02 18:08 - DEC 02 18:21	PnnRin
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++++			DEC 02 18:07 - DEC 02 18:16	PnnRin



Uranus_2036-12-02T18_42_28.6500_PMO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:21:02 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-12-02T18:42:23.400
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code : PMO
Location : Purple Mtn Obs. Nanking
Latitude (deg) : 32.06667
E. Longitude (deg) : 118.82089
Altitude (km) : 0.364
Gaia source ID : 869237441534288640
2Mass ID (if available) : 07201437+2235526
ICRS Star Coord at Epoch: 07h 20m 14.37314s +22:35:52.66966s
RUWE (>1.4 is poor) : 1.04
K magnitude : 14.994
G magnitude : 16.115
RP magnitude : 15.684
BP magnitude : 16.376
DUPflag : 0
Distance (au) : 17.981
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -17.06
Sun-Target sep (deg) : 142.20
Sun-Moon sep (deg) : 49.19
B (ring opening deg) : 58.21
PA of pole (deg) : 82.34
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.274
C/A sky separation (km) : 42693.6
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

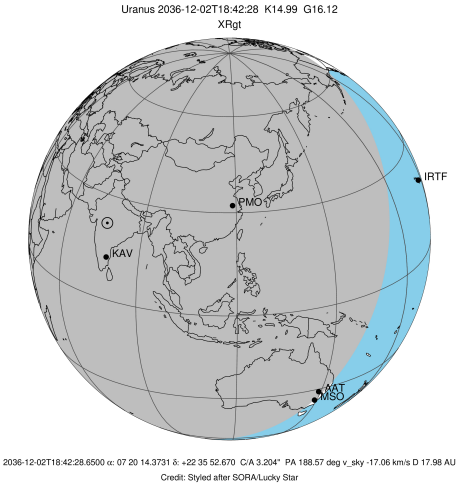
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-12-02T18:17:22.849		79.53	-56.85	50784.87	-10.64		
lambda	I	2036-12-02T18:18:35.161		79.65	-56.60	50026.71	-10.27		
delta	I	2036-12-02T18:21:33.149		79.91	-55.98	48300.35	-9.11		
gamma	I	2036-12-02T18:22:48.932		80.01	-55.71	47629.65	-8.57		
eta	I	2036-12-02T18:23:42.987		80.08	-55.52	47176.12	-8.19		
beta	I	2036-12-02T18:27:04.170		80.30	-54.81	45681.17	-6.65		
alpha	I	2036-12-02T18:29:48.434		80.44	-54.24	44701.04	-5.26		

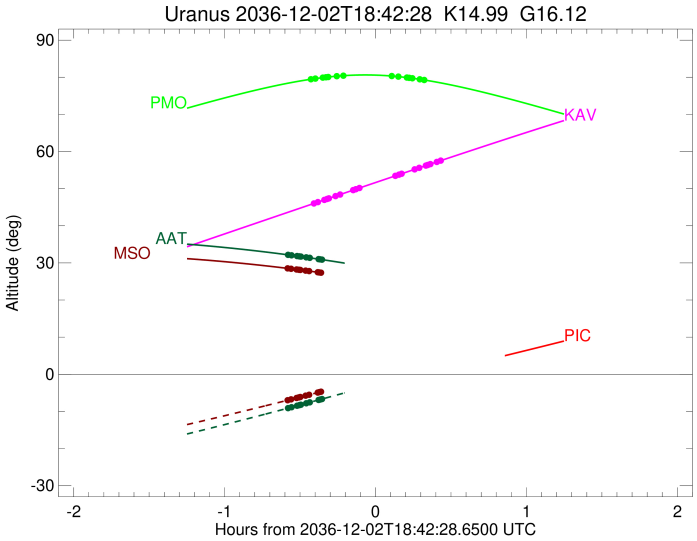
No planet occultations

alpha	E	2036-12-02T18:48:48.638		80.35	-50.22	44688.86	5.27		
beta	E	2036-12-02T18:51:34.234		80.18	-49.63	45677.85	6.65		
eta	E	2036-12-02T18:54:55.646		79.93	-48.92	47176.12	8.20		
gamma	E	2036-12-02T18:55:49.183		79.86	-48.73	47625.31	8.59		
delta	E	2036-12-02T18:57:05.451		79.75	-48.46	48300.35	9.12		
lambda	E	2036-12-02T19:00:03.386		79.46	-47.83	50026.71	10.27		
epsilon	E	2036-12-02T19:01:19.446		79.33	-47.57	50825.29	10.64		

Uranus_2036-12-02T18_42_28.6500_KAV.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:31:46 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-12-02T18:46:12.440
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code : KAV
Location : Kavalur Observatory
Latitude (deg) : 12.57556
E. Longitude (deg) : 78.83167
Altitude (km) : 0.722
Gaia source ID : 869237441534288640
2Mass ID (if available) : 07201437+2235526
ICRS Star Coord at Epoch: 07h 20m 14.37314s +22:35:52.66966s
RUWE (>1.4 is poor) : 1.04
K magnitude : 14.994
G magnitude : 16.115
RP magnitude : 15.684
BP magnitude : 16.376
DUPflag : 0
Distance (au) : 17.981
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -17.06
Sun-Target sep (deg) : 142.20
Sun-Moon sep (deg) : 48.64
B (ring opening deg) : 58.21
PA of pole (deg) : 82.34
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.103
C/A sky separation (km) : 40470.4
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

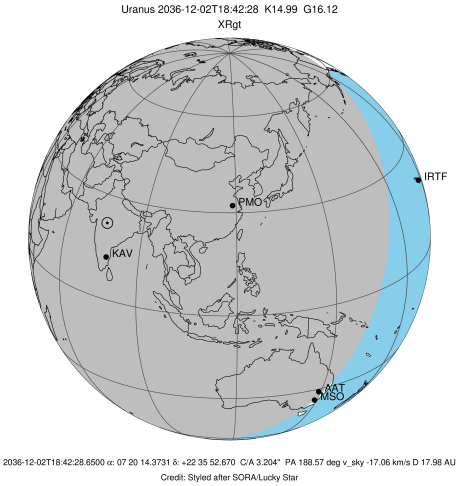
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-12-02T18:18:30.197		46.13	-79.67	50798.74	-11.92		
lambda	I	2036-12-02T18:19:35.576		46.38	-79.76	50026.71	-11.63		
delta	I	2036-12-02T18:22:09.781		46.98	-79.96	48300.35	-10.74		
gamma	I	2036-12-02T18:23:13.343		47.22	-80.03	47630.02	-10.35		
eta	I	2036-12-02T18:23:57.822		47.39	-80.07	47176.12	-10.06		
beta	I	2036-12-02T18:26:34.761		47.99	-80.21	45680.84	-8.99		
alpha	I	2036-12-02T18:28:28.753		48.43	-80.28	44705.41	-8.12		
4	I	2036-12-02T18:33:32.786		49.59	-80.38	42606.26	-5.62		
5	I	2036-12-02T18:34:50.073		49.89	-80.38	42199.44	-4.87		
6	I	2036-12-02T18:36:15.655		50.22	-80.37	41812.07	-4.14		

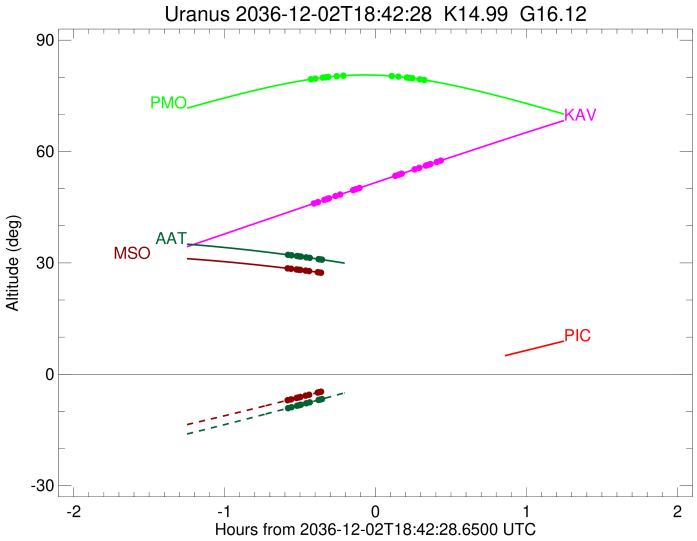
No planet occultations

6	E	2036-12-02T18:50:18.468		53.43	-79.66	41827.85	4.15		
5	E	2036-12-02T18:51:32.608		53.72	-79.55	42170.02	4.88		
4	E	2036-12-02T18:52:57.772		54.04	-79.41	42616.21	5.63		
alpha	E	2036-12-02T18:57:56.540		55.17	-78.86	44686.67	8.14		
beta	E	2036-12-02T18:59:51.606		55.61	-78.62	45676.24	9.01		
eta	E	2036-12-02T19:02:28.386		56.20	-78.28	47176.12	10.09		
gamma	E	2036-12-02T19:03:12.219		56.37	-78.18	47624.76	10.38		
delta	E	2036-12-02T19:04:16.077		56.61	-78.03	48300.35	10.78		
lambda	E	2036-12-02T19:06:49.727		57.19	-77.66	50026.71	11.68		
epsilon	E	2036-12-02T19:07:58.848		57.45	-77.48	50846.85	11.96		

Uranus_2036-12-02T18_42_28.6500_AAT.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:38:13 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-12-02T18:38:49.320
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code : AAT
Location : Siding Spring (AAT)
Latitude (deg) : -31.27703
E. Longitude (deg) : 149.06608
Altitude (km) : 1.164
Gaia source ID : 869237441534288640
2Mass ID (if available) : 07201437+2235526
ICRS Star Coord at Epoch: 07h 20m 14.37314s +22:35:52.66966s
RUWE (>1.4 is poor) : 1.04
K magnitude : 14.994
G magnitude : 16.115
RP magnitude : 15.684
BP magnitude : 16.376
DUPflag : 0
Distance (au) : 17.981
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -17.06
Sun-Target sep (deg) : 142.20
Sun-Moon sep (deg) : 49.11
B (ring opening deg) : 58.21
PA of pole (deg) : 82.34
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.859
C/A sky separation (km) : 37286.6
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





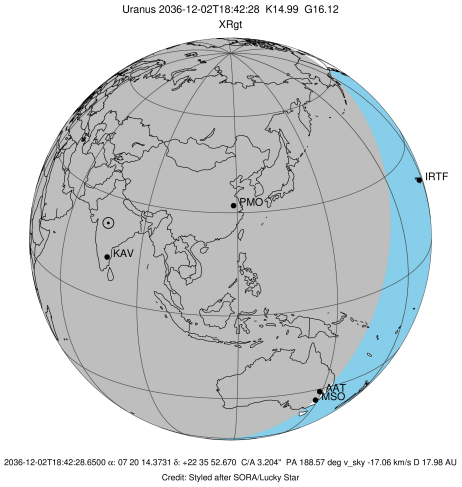
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-12-02T18:08:07.636		32.13	-9.05	50823.32	-13.53		
lambda	I	2036-12-02T18:09:06.808		32.04	-8.87	50026.71	-13.33		
delta	I	2036-12-02T18:11:19.548		31.84	-8.47	48300.35	-12.67		
gamma	I	2036-12-02T18:12:12.999		31.76	-8.31	47630.47	-12.39		
eta	I	2036-12-02T18:12:49.972		31.70	-8.20	47176.12	-12.19		
beta	I	2036-12-02T18:14:56.570		31.50	-7.82	45680.03	-11.45		
alpha	I	2036-12-02T18:16:23.441		31.36	-7.55	44710.67	-10.89		
4	I	2036-12-02T18:19:50.652		31.02	-6.92	42599.39	-9.45		
5	I	2036-12-02T18:20:31.548		30.95	-6.80	42216.83	-9.09		
6	I	2036-12-02T18:21:18.453		30.87	-6.65	41804.36	-8.78		

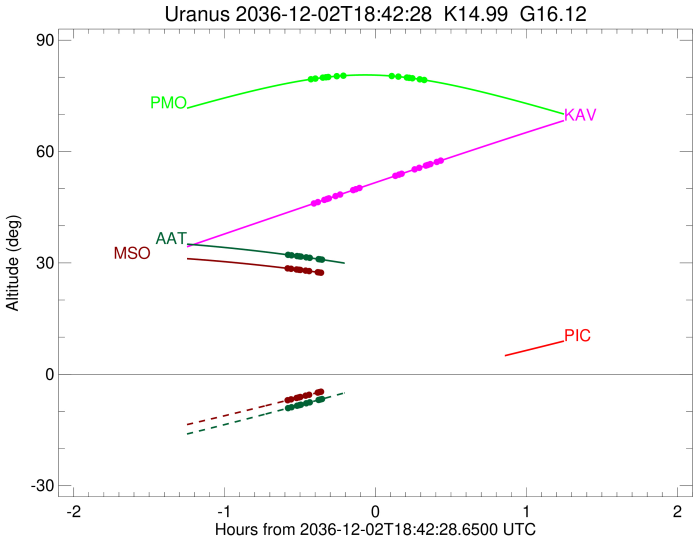
No planet occultations

6	E	2036-12-02T18:51:08.227		27.52	-1.06x	41837.68	8.77		
5	E	2036-12-02T18:51:43.859		27.44	-0.95x	42161.55	9.07		
4	E	2036-12-02T18:52:32.920		27.34	-0.79x	42616.46	9.44		
alpha	E	2036-12-02T18:55:55.763		26.92	-0.14x	44685.32	10.87		
beta	E	2036-12-02T18:57:24.219		26.73	0.14x	45674.37	11.43		
eta	E	2036-12-02T18:59:31.348		26.46	0.55x	47176.12	12.16		
gamma	E	2036-12-02T19:00:07.887		26.38	0.67x	47624.20	12.36		
delta	E	2036-12-02T19:01:01.954		26.26	0.84x	48300.35	12.65		
lambda	E	2036-12-02T19:03:14.980		25.97	1.27x	50026.71	13.30		
epsilon	E	2036-12-02T19:04:17.952		25.84	1.47x	50873.07	13.49		

Uranus_2036-12-02T18_42_28.6500_MSO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:42:28 2023




```
target                  : Uranus
target radius (km)      :  25559.00
C/A epoch               : 2036-12-02T18:38:55.160
Event type              : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code           : MSO
Location                : Mt. Stromlo Observatory
Latitude (deg)          : -35.32000
E. Longitude (deg)      : 149.00833
Altitude (km)           :   0.770
Gaia source ID          : 869237441534288640
2Mass ID (if available) : 07201437+2235526
ICRS Star Coord at Epoch: 07h 20m 14.37314s +22:35:52.66966s
RUWE (>1.4 is poor)     :   1.04
K magnitude             : 14.994
G magnitude             : 16.115
RP magnitude            : 15.684
BP magnitude            : 16.376
DUPflag                 : 0
Distance (au)           : 17.981
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -17.06
Sun-Target sep (deg)    :  142.20
Sun-Moon sep (deg)      :   49.06
B (ring opening deg)    :   58.21
PA of pole (deg)        :   82.34
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")  :   2.838
C/A sky separation (km) :  37005.1
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
```



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-12-02T18:07:57.315		28.49	-6.92	50825.26	-13.64		
lambda	I	2036-12-02T18:08:56.130		28.41	-6.76	50026.71	-13.44		
delta	I	2036-12-02T18:11:07.595		28.23	-6.38	48300.35	-12.81		
gamma	I	2036-12-02T18:12:00.458		28.15	-6.23	47630.51	-12.53		
eta	I	2036-12-02T18:12:37.000		28.10	-6.12	47176.12	-12.34		
beta	I	2036-12-02T18:14:41.920		27.92	-5.76	45679.96	-11.62		
alpha	I	2036-12-02T18:16:07.381		27.79	-5.52	44711.05	-11.08		
4	I	2036-12-02T18:19:30.389		27.49	-4.93x	42598.90	-9.70		
5	I	2036-12-02T18:20:10.021		27.43	-4.81x	42217.96	-9.34		
6	I	2036-12-02T18:20:55.801		27.35	-4.68x	41803.96	-9.05		

No planet occultations

6	E	2036-12-02T18:51:44.315		24.15	0.83x	41838.35	9.04		
5	E	2036-12-02T18:52:18.821		24.08	0.93x	42161.07	9.33		
4	E	2036-12-02T18:53:06.617		23.99	1.08x	42616.41	9.68		
alpha	E	2036-12-02T18:56:25.241		23.60	1.68x	44685.24	11.06		
beta	E	2036-12-02T18:57:52.282		23.43	1.95x	45674.20	11.60		
eta	E	2036-12-02T18:59:57.723		23.18	2.34x	47176.12	12.31		
gamma	E	2036-12-02T19:00:33.826		23.11	2.45x	47624.15	12.51		
delta	E	2036-12-02T19:01:27.299		23.00	2.61x	48300.35	12.78		
lambda	E	2036-12-02T19:03:39.034		22.74	3.02x	50026.71	13.42		
epsilon	E	2036-12-02T19:04:41.657		22.61	3.21x	50875.62	13.61		